$$p(y\,|\,\bar{x},D) = \mathcal{N}\left(y \,\middle|\, \bar{\mu}_N^T \bar{x},\ \sigma_N^2\right), \qquad \bar{\mu}_N = \frac{1}{\sigma^2}\Sigma_N X^T \bar{y}$$

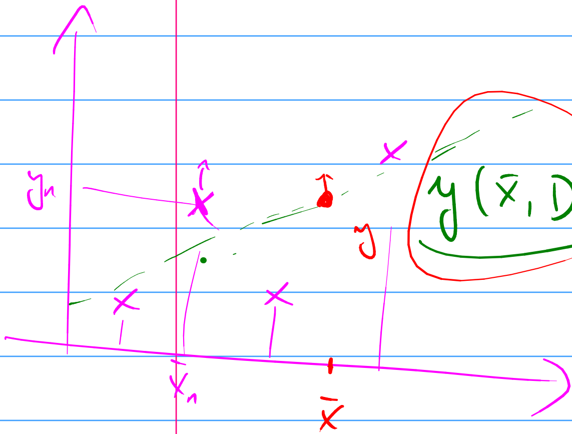
$$D = \{(\bar{x}_n, y_n)\}$$

$$\sigma_N^2 = \sigma^2 + \bar{x}^T \Sigma_N \bar{x}$$

$$y(\bar{x},D) = \bar{x}^T \cdot \frac{1}{\sigma^2}\Sigma_N X^T \bar{y} = \sum_{n=1}^{N} \underbrace{\frac{1}{\sigma^2}\left(\bar{x}^T \cdot \Sigma_N \cdot \bar{x}_n\right)}_{k(\bar{x},\bar{x}_n)} y_n$$

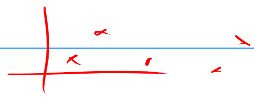
$$X^T\bar{y} = \sum_{n=1}^{N} \bar{x}_n y_n$$

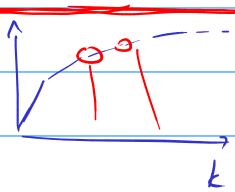
equivalent kernel

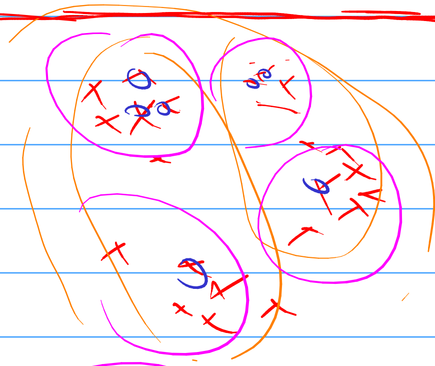


$$y(\bar{x},D) = \sum_{n=1}^{N} k(\bar{x},\bar{x}_n)\, y_n$$

Model selection







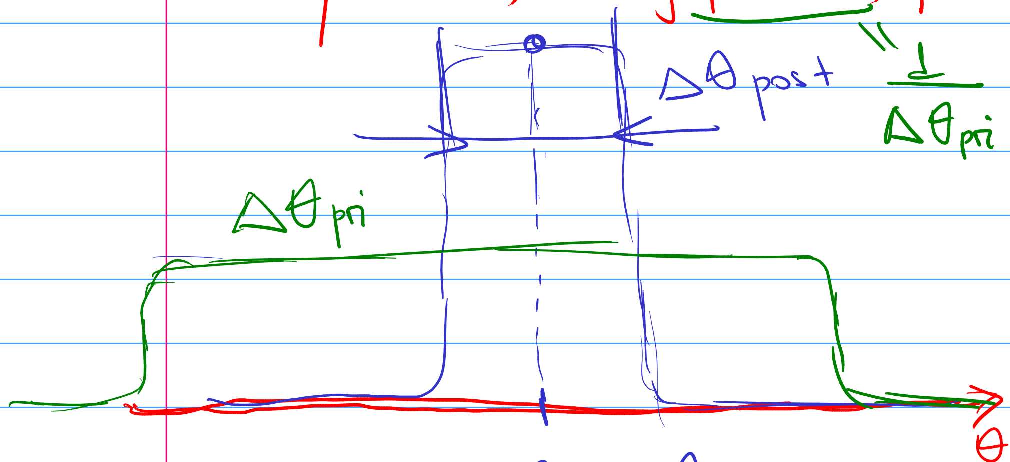
$M_1, M_2, \dots, M_k$ $\quad D$?

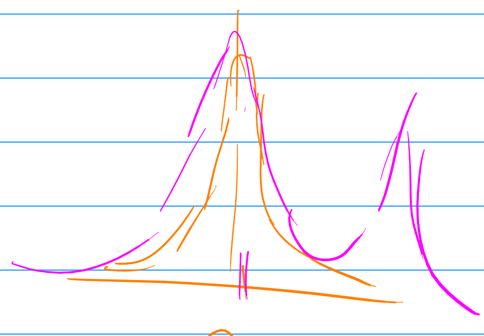
$$p(M_i\,|\,D) \propto \overset{\text{prior}}{p(M_i)}\, p(D\,|\,M_i)$$

$$p(\bar{\theta}\,|\,D,M_i) = \frac{p(\bar{\theta}\,|\,M_i)\, p(D\,|\,\bar{\theta},M_i)}{p(D\,|\,M_i)}$$

$$\{\ p(D\,|\,\theta_{ML}),\ \Delta\theta_{post}\ \ \theta, \dots$$

$$p(D\,|\,M_i) = \int \underbrace{p(\bar{\theta}\,|\,M_i)}_{\frac{1}{\Delta\theta_{pri}}}\, p(D\,|\,\bar{\theta},M_i)\, d\bar{\theta}$$





$$\theta_{MAP} = \theta_{ML}$$

$$p(\theta_{MAP}\,|\,D) = \frac{1}{\Delta\theta_{post}} \propto p(\bar{\theta})\, p(D\,|\,\bar{\theta})$$

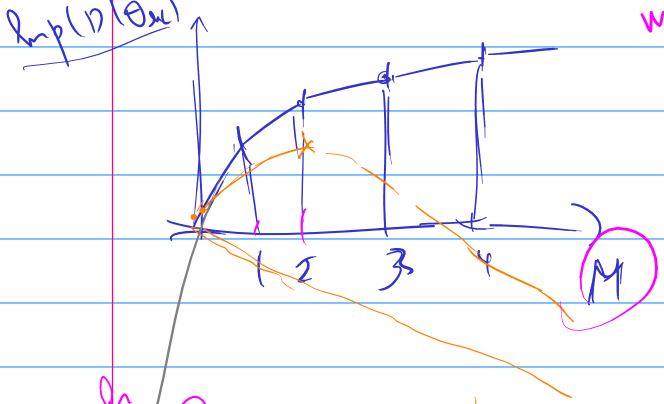
$$p(D|M_i) = \frac{1}{\Delta\theta_{pri}}\, p(D|\theta_{ML}) \int_{\Delta\theta_{post}} 1\, d\theta =$$

$$= \frac{\Delta\theta_{post}}{\Delta\theta_{pri}}\, p(D|\theta_{ML})$$

$$\ln p(D|M_i) = \ln p(D|\theta_{ML}, M_i) - M \ln \frac{\Delta\theta_{pri}}{\Delta\theta_{post}}$$

$\bar\theta = (\theta_1 - \theta_M)$

max



$$BIC(M_i) = \ln p(\bar D|\theta_{ML}, \bar M_i) - \frac{1}{2} M_i \ln N$$

$N = |D|$

AIC

$p(a|D)$

$p(\bar w) = \prod N(w_i|0, \sigma_0^2)$

$p(\bar w|D)$

$$y = \frac{1}{1+e^{-w_1x-w_0}}$$

$$w_1x + w_0 = -\ln\left(\frac{1}{y} - 1\right)$$

$p(A,B|C)$

conditional indep.

$$p(A,B) = p(A)\,p(B|A)$$

$$p(x|y) = \frac{p(x,y)}{p(y)}$$

$A,B \perp\!\!\!\perp C$

$p(A,B|C) = p(A|C)\,p(B|C)$

$$p(A,B|C) = p(A|C)\,p(B|A,C)$$

$$\frac{p(A,B,C)}{p(C)} \;?\; \frac{\cancel{p(A,C)}}{p(C)} \cdot \frac{p(A,B,C)}{\cancel{p(A,C)}}$$

$p(A|B=b, C=c)$